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EP-A- 0 040 312
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Description

This invention relates to an ink ribbon cassette wherein the ink ribbon is re-inked during use, and more particularly to an arrangement comprising an ink ribbon cassette body, an ink ribbon, first and second rotary gear members between which said ink ribbon is driven, said members having meshing toothed peripheries for contacting the ribbon and each comprising a succession of peaks and valleys, and means for supplying ink onto a said rotary gear member to supply ink to the ribbon.

Japanese Utility Model serial No. 58-25727 filed February 25, 1983 (laid-open publication No. 59-131851) in the name of Yoshinori Koshida and Kenji Kanabo discloses an ink ribbon cartridge in which an ink ribbon is re-inked to extend its life. The cartridge contains an ink supply roller charged with ink, and a ribbon feed drive roller in contact with the supply roller thereby allowing ink to be transferred to a ribbon feed surface of the ribbon feed drive roller in response to rotation thereof. The ink supply roller moves very slowly in comparison with the ribbon feed drive roller due to the action of a number of combining gears. Also, a cam is provided allowing the ink supply roller to be depressed gradually under high pressure. Thus, the ink held in the ink supply roller is gradually squeezed out and transferred to the ribbon drive roller. The ink on the surface of the ribbon drive roller is transferred to an ink ribbon that passes between the ribbon drive roller and a ribbon feed driven roller. Hence, the operative life of the ink ribbon is lengthened. Further, Koshida et al discloses a ribbon cartridge having a ribbon feed drive roller comprising a plurality of rollers of the same diameter, each of which is integrally fixed to a common shaft at an appropriate interval, and a ribbon feed driven roller comprising rollers the same as those of ribbon feed drive roller integrally fixed to another shaft at the location opposite to the feed drive roller. The ribbon is held between the ribbon feed drive roller and the ribbon feed driven roller.

A disadvantage of these known configurations is that the ink ribbon cannot be driven accurately due to slip between the ribbon feed drive roller or the ribbon feed driven roller and the ink ribbon upon an increase in load. Thus, upon an increase in ribbon load, ink is squeezed out of the ink ribbon when contact pressure sufficient to drive the ink ribbon accurately is applied to the ribbon feed drive roller and the ribbon feed driven roller. The squeezed ink tends to overflow onto a portion of the ink ribbon which is not held by the roller and consequently decreases the amount of ink on the portion of the ribbon which is held by the roller. Thus, with fluctuations in load, as occurs in practice, repetitive fluctuations in ink loading occur along the ribbon, which gives rise to undesired fluctuations in print density.

Another ribbon cassette with a re-inking mechanism is disclosed in WO 85/01017. The ink ribbon is fed between rollers having sharply pointed meshing teeth, one of the rollers being driven. The other is supplied with ink from a reservoir such as to distribute ink onto the ribbon. Also, it is known from US-A-4213716 to utilise meshing teeth having a rounded tooth shape, to drive an ink ribbon, but not for the purpose of re-inking the ribbon.

An object of the present invention is to provide an ink-ribbon cassette wherein re-inking is achieved in a manner which produces a uniform ink distribution along the length of the ribbon, whereby to provide uniform print density.

To this end, the present invention is characterised in that in order to provide uniform application of the ink to the ribbon, the valley portions of the gear member that receives ink from the supply means are in the shape of a circular arc when viewed in transverse cross section, and the closest distance between the bottom of the valley of one of the gear members and the meshing apex of the peak of the other of the gear members is less than the thickness of the ink ribbon.

The cassette according to the invention has the advantage of providing uniform re-inking of the ribbon. Further, the ink ribbon is not damaged by the gear thereby to provide an ink ribbon cassette having a long life cycle.

In order that the invention may be fully understood, embodiments thereof will now be described with reference to the accompanying drawings, wherein :

Figure 1 is a plan view showing an ink ribbon cassette with a cover thereof removed to show an ink tank therein, according to a first embodiment of the present invention ;

Figure 2 is a similar plan view of an embodiment of the present invention ;

Figure 3 is a schematic view illustrating a portion of Figure 2 where ink is transferred to the ink ribbon ;

Figure 4 is a schematic view showing an example of the passage of the ink ribbon between the gears, showing the shape of the gears in detail ;

Figure 5 is a schematic view showing another configuration of the gears ;

Figure 6 is a schematic view showing still another configuration of the gears ;

Referring to Figure 1, an ink ribbon cassette body 1 includes an ink tank 2 filled with ink. An opening is provided to the ink tank 2 and an ink supplier 9 is provided in the vicinity of the opening. The ink supplier 9 is desirably made of a material capable of absorbing ink, such as a felt or sponge. An ink ribbon container 1a having two openings disposed at opposite ends is provided in the middle of the ink ribbon cassette body. An endless ink ribbon 8 stored in the ink ribbon container 1a is delivered in a loop through one of the

openings of the ink ribbon container 1a back into the other container opening via the front portion of the cassette body, to be impacted by the printing head of a wire dot printer (not shown). The ink ribbon 8 is driven around the loop by means of a drive gear 5 and an idle gear 6 which is urged by a spring 7 to pinch the ribbon 8 between the gears 7, 8. The ink ribbon is loaded with ink. The ink in the ink ribbon is gradually consumed during printing as a result of the action of the wire dot printer (not shown) which transfers in from the ink ribbon to a paper sheet being printed (not shown). The ribbon 8 is re-loaded with ink during its passage between the drive gear 5 and the idle gear 6. The ink supplier 9 transfers ink from the ink tank 2 to the idle gear 6 and thence ink is transferred to the ribbon 8 itself.

A feature of the present invention resides in the shape of the drive gear and the idle gear. Before describing this feature in detail, another embodiment of ink ribbon cassette will be described with reference to Figure 2.

The ink ribbon cassette shown in Figure 2 has an ink supply roller 2a which is different from the ink ribbon cassette as shown in Figure 1. The ink supply roller 2a is made of a material which can absorb ink such as a felt or sponge. An ink ribbon 8 passes between a drive gear 5 and an idle gear 6 and thereafter is delivered to the inside of ribbon container 1a. The ink supply roller 2a is all the time in contact with the idle gear 6 and rotatable. The ink supply roller 2a is rotatably mounted on the ink ribbon cassette body 1. Ink within the ink supply roller 2a is passed onto the idle gear 6 and is thereby supplied to the ink ribbon 8.

Figure 3 shows on an enlarged scale the manner in which the ink is transferred to the ink ribbon, in accordance with a feature of the present invention. When the idle gear 6 is rotated in the direction of arrow B, the drive gear 5 is rotated in the direction of arrow A, and the ink ribbon 8 is delivered in the direction of arrow C. The idle gear 6 is in contact with the ink supply roller 2a thereby receiving ink from it and delivering the ink in the direction of the arrow B. The ink delivered to the region where the drive gear 5 and the idle gear 6 mesh with each other is supplied to the ink ribbon 8. The portion of the ribbon 8 shaded with slanted lines in Figure 3 is depleted of ink (due to the action of the printing head) and the portion shaded black has been replenished with ink from the idle gear 6. A feature of the present invention resides in a specific shape of teeth of the idle gear and the drive gear, that is, the teeth of the idle gear are formed to meet the shape of the ink ribbon 8 which is held between the drive gear 5 and the idle gear 6. The shape of the teeth is determined in the following way :

It will be seen that the gears 5, 6 comprise a sequence of teeth that define peaks and valleys when viewed in transverse cross section. Referring to Figure 4, the apex of each peak and valley of the gear 5 is pointed, but in accordance with the invention, the valleys of the gear 6 are in the form of a circular arc when viewed in transverse cross section. The shape of the valley 6b of the gear 6 is defined around the pointed apex of peak 5a by a circular arc of a radius slightly less than the thickness of the ink ribbon 8 generated around the tip 5a so that the valley 6b of the idle gear 6b becomes a portion of the circular arc. Figure 4 shows a pointed apex of a peak of a tooth of the idle gear 6.

A second embodiment of the gears shown in Figure 5 is similar to that of Figure 4, with the additional feature that the peak 5a of the gear 5 is in the form of a circular arc, rather than being pointed as shown in Figure 4. The valley 6b of gear 6 is in the shape of a circular arc concentric with the arc that defines peak 5a, and the radial distance or spacing between the arcs 5a, 5b is less than the thickness of the ink ribbon 8. Damage to the ink ribbon is lessened by this arrangement.

According to a third embodiment shown in Figure 6, the peak 5a and the valley 5b of the drive gear 5, the peak 6b and the valley 6a of the idle gear 6 are all shaped as a circular arc so that the damage of the ink ribbon 8 is caused by the teeth of the gears is reduced further. In each of the embodiments, the ink supplied from the ink supply roller 2a to the idle gear 6 is transferred to the ink ribbon 8 in the region thereof held by the drive gear 5 and the idle gear 6. The ink ribbon 8 is thus held in contact with all regions of the teeth of the idle gear 6 under an appropriate pressure so that the ink is entirely transferred to the ink ribbon 8. According to the present invention, the ink is not retained in the valleys of the teeth and is uniformly transferred to the ink ribbon 8.

Although the ink supply roller 2a is described as the ink supply means in Figure 3, it can be substituted by the ink tank 2 and the ink supplier 9 as the ink supply means.

Claims

1. An ink ribbon cassette comprising an ink ribbon cassette body (1), an ink ribbon (8), first and second rotary gear members (5, 6) between which said ink ribbon is driven, said members having meshing toothed peripheries for contacting the ribbon and each comprising a succession of peaks (5a, 6a) and valleys (5b, 5d) and means for supplying ink (2a, 9) onto a said rotary gear member (16) to supply ink to the ribbon (18), characterised in that in order to provide uniform application of the ink to the ribbon (8), the valley portions of the gear member (6) that receives ink from the supply means (2a, 9) are in the shape of a circular arc when viewed in transverse cross section, and the closest distance between the bottom of the valley of one of the gear members (5) and the

meshing apex of the peak of the other of the gear members (6) is less than the thickness of the ink ribbon (8).

2. An ink ribbon cassette according to claim 1 wherein one of said gear members is a drive gear (5) and the other is an idle gear (6) driven by the drive gear.

3. An ink ribbon cassette according to claim 1 or 2 wherein the ink supply means includes an ink tank (2) and an ink supplier (9) to supply ink from the tank (2) to a said gear member (6).

4. An ink ribbon cassette according to claim 1 or 2 wherein the ink supply means includes an ink roller (2a) for being loaded with ink.

5. An ink ribbon cassette according to any preceding claim wherein the peaks of the gear member (5) that meshes with the gear member (6) supplied with ink, are also in the shape of an arc when viewed in transverse cross section.

6. An ink ribbon cassette according to claim 5 wherein the peaks and valleys (5a, 5b ; 6a, 6b) of both of the gear members (5, 6) are in the shape of an arc when viewed in transverse cross section.

Ansprüche

1. Farbbandkassette mit einem Farbbandkörper (1), einem Farbband (8), ersten und zweiten drehbaren Radgliedern (5, 6), zwischen denen das Farbband angetrieben ist, wobei die Glieder miteinander in Eingriff kommende gezahnte Außenflächen zum Kontaktieren des Bandes aufweisen und eine jede eine Folge von Erhebungen (5a, 6a) und Tälern (5b, 5d) umfaßt, und mit einer Tintenzuführeinrichtung (2a, 9) für eines der drehbaren Radglieder (16), um dem Band (18) Tinte zuzuführen, dadurch gekennzeichnet, daß zum Zwecke eines gleichmäßigen Auftragens der Tinte auf das Band (8) die Talabschnitte desjenigen Radgliedes (6), welches die Tinte von der Zuführeinrichtung (2a, 9) aufnimmt, quer zum Querschnitt gesehen kreisbogenförmig ausgebildet sind, und daß der kleinste Abstand zwischen dem Talboden eines der Radglieder (5) und dem in Eingriff kommenden Scheitel der Erhebung des anderen Radgliedes (6) kleiner ist als die Dicke des Farbbandes (8).

2. Farbbandkassette nach Anspruch 1, wobei eines der Radglieder ein Antriebsrad (5) und das andere ein Leerlaufrad (6) ist, welches vom Antriebsrad angetrieben ist.

3. Farbbandkassette nach Anspruch 1 oder 2, wobei die Tintenzuführeinrichtung einen Tintentank (2) und einem Tintenzuführer (9) umfaßt, um Tinte vom Tank (2) zum Radglied (6) zuzuführen.

4. Farbbandkassette nach Anspruch 1 oder zwei, wobei die Tintenzuführeinrichtung eine mit Tinte zu versehende Tintenwalze (2a) umfaßt.

5. Farbbandkassette nach einem der vorhergehenden Ansprüche, wobei die Erhebungen des mit dem Radglied (6), welches mit Tinte versorgt wird, in Eingriff stehenden Radgliedes (5) quer zum Querschnitt gesehen ebenfalls bogenförmig ausgebildet sind.

6. Farbbandkassette nach Anspruch 5, wobei die Erhebungen und Täler (5a, 5b ; 6a, 6b) beider Radglieder (5, 6) quer zum Querschnitt gesehen bogenförmig ausgebildet sind.

Revendications

1. Cassette de ruban encreur comprenant un corps (1) de cassette de ruban encreur, un ruban encreur (8), des premier et second éléments d'engrenage tournants (5, 6) entre lesquels ledit ruban encreur est entraîné, lesdits éléments ayant des périphéries dentées en prise destinées à entrer en contact avec le ruban et comprenant chacun une succession de crêtes (5a, 6a) et de creux (5b, 5d) et des moyens destinés à amener le ruban (2a, 9) sur un élément d'engrenage rotatif (18) pour fournir de l'encre au ruban (18), caractérisée en ce que, pour réaliser une application uniforme de l'encre sur le ruban (8), les parties en creux de l'élément d'engrenage (6) qui reçoit l'encre des moyens d'amenée (2a, 9) sont sous la forme d'un arc de cercle lorsqu'elles sont vues en coupe transversale, et la distance la plus faible entre le fond du creux de l'un des éléments d'engrenage (5) et le sommet engrenant de la crête de l'autre des éléments d'engrenage (6) est inférieure à l'épaisseur du ruban encreur (8).

2. Cassette de ruban encreur selon la revendication 1, dans laquelle l'un desdits éléments d'engrenage est une roue dentée menante (5) et l'autre est une roue dentée folle (6) entraînée par la roue dentée menante.

3. Cassette de ruban encreur selon la revendication 1 ou 2, dans laquelle les moyens d'amenée d'encre comprennent un réservoir d'encre (2) et un distributeur d'encre (9) destiné à amener de l'encre du réservoir (2) à l'un desdits éléments d'engrenage (6).

4. Cassette de ruban encreur selon la revendication 1 ou 2, dans laquelle les moyens d'amenée d'encre comprennent un rouleau encreur (2a) destiné à être chargé d'encre.

5. Cassette de ruban encreur selon l'une quelconque des revendications précédentes, dans laquelle les crêtes de l'élément d'engrenage (5) qui engrène avec l'élément d'engrenage (6) alimenté en encre ont également la forme d'un arc lorsqu'elles sont vues en coupe transversale.

6. Cassette de ruban encreur selon la revendication 5, dans laquelle les crêtes et les creux (5a, 5b ; 6a, 6b) des deux éléments d'engrenage (5, 6) se présentent sous la forme d'un arc lorsqu'elles sont vues en coupe transversale.

Fig. 1

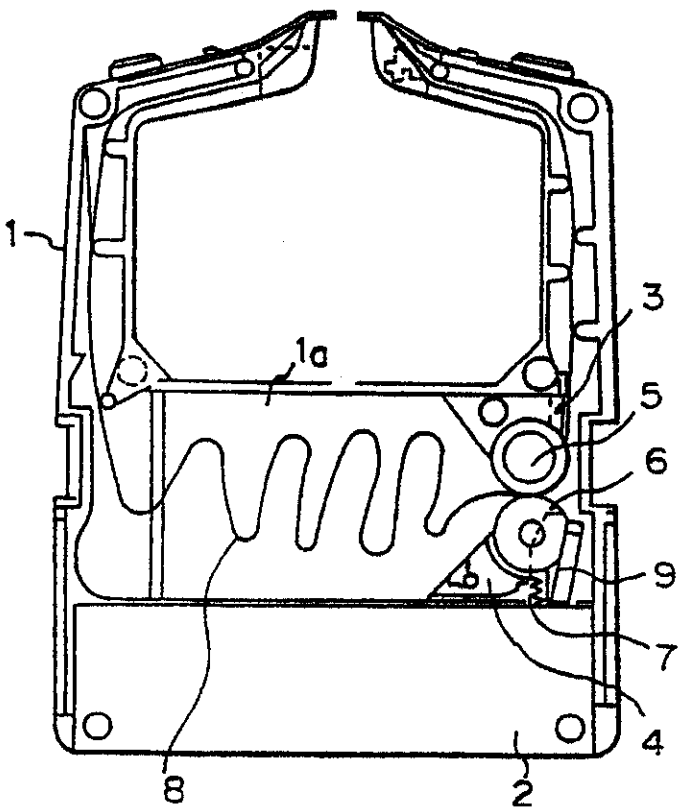


Fig. 2

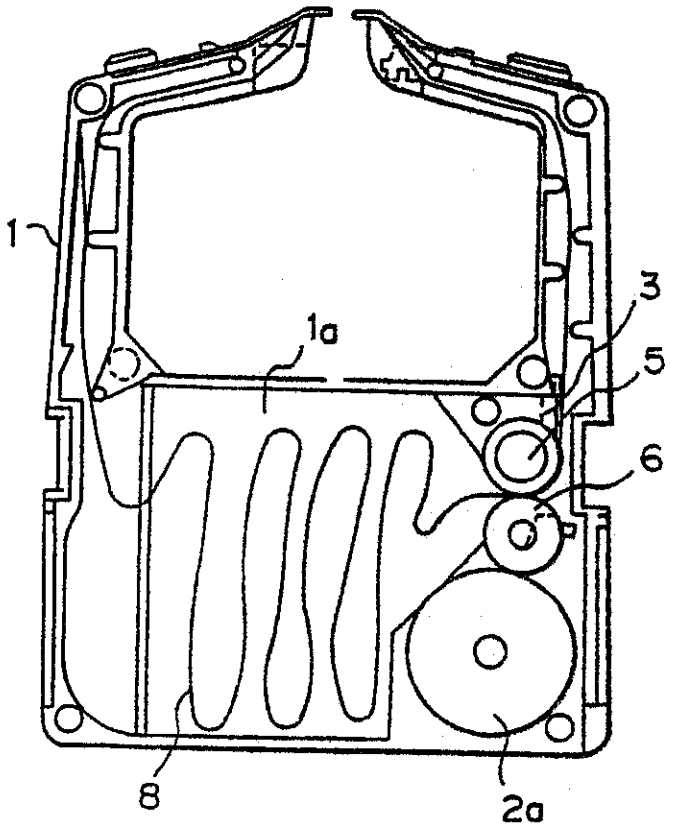


Fig. 3

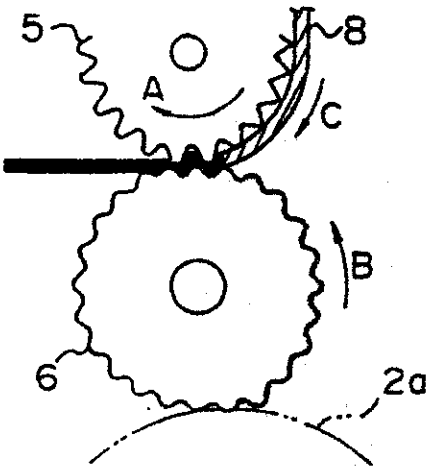


Fig. 4

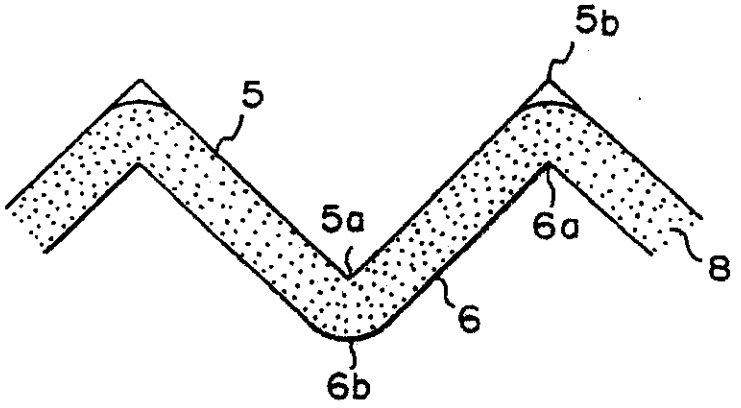


Fig. 5

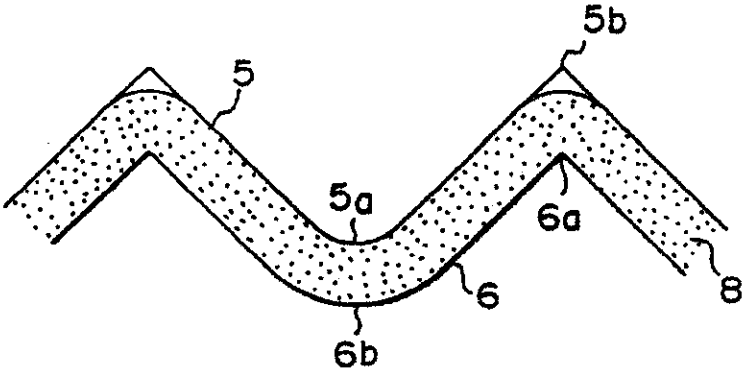
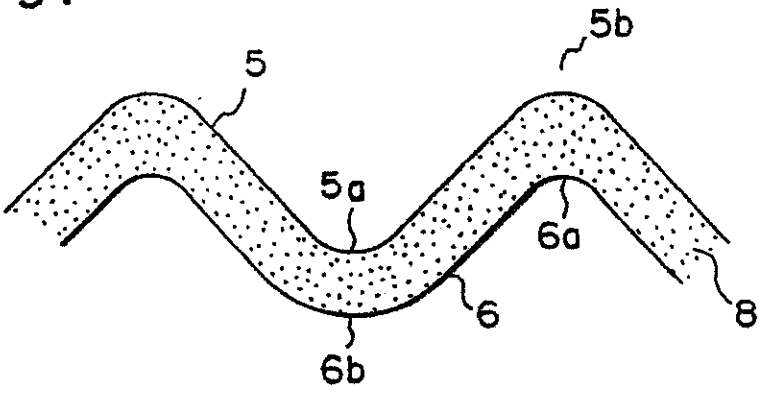


Fig. 6



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